UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/769,605	01/30/2004	Cyprian E. Uzoh	ASMNUT.001A	8773

20995 7590 05/30/2006

KNOBBE MARTENS OLSON & BEAR LLP
2040 MAIN STREET
FOURTEENTH FLOOR
IRVINE, CA 92614

EXAMINER	
SMITH, NICHOLAS A	

ART UNIT	PAPER NUMBER
1742	

DATE MAILED: 05/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/769,605	UZOH ET AL.	
	Examiner	Art Unit	
	Nicholas A. Smith	1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 March 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4-7,9-13,15,16 and 20-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4-7,9-13,15-16 and 20-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of claims 1, 4-7, 9-13, 15-16 and 20 in the reply filed on 3/14/2006 is acknowledged.

Status of Claims

Claims 1, 4-7, 9-13, 15-16 and 20 remain for examination. Claims 21-37 are new. Claims 2, 3, 8, 14 and 17-19 have been cancelled.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 4-5, 7, 9-10, 15-16, 20-23, 25-26, 29, 32 and 36-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dubin et al. (US Patent No. 6,4,32,821) as evidenced by Uzoh et al. (US 20002/0061715).

Dubin et al. '821 as evidenced by Uzoh et al. is applied to claims 1, 4-5, 7, 9-10, 15-16 and 20 for the same reasons as stated in pages 4-5 in the previous office action.

In regards to the amended feature "anodic current waveform" in claims 1, 9 and 15, Dubin et al. '821 teaches the step of treating comprising an anodic current waveform (see Figure 7, element 710).

In regards to the amended feature "treating a surface of the second conductive layer by applying a second anodic current waveform" in claims 1, 9 and 15, Dubin et al.

'821 teaches the step of treating a surface of a second conductive layer by applying a second anodic current waveform (Figure 7, element 718).

In regards to the amended feature "wherein the second anodic current waveform has a longer duration than the first anodic current waveform" in claims 1, 9 and 15, Dubin et al. '821 does not specifically teach a second current waveform having a longer duration thant the first anodic current waveform.

Dubin et al. '821 teaches that the current densities and length of times for each forward or reverse plating step can be varied (col. 6, lines 42-46). It would have been obvious to one of ordinary skill in the art at the time of invention to choose a second anodic current waveform having a longer duration than a first anodic current as Dubin et al. '821 states that the duration of each forward and reverse plating step can be optimized so that the process as a whole provides a reduction or elimination of voids when filling small openings in an interlayer dielectric film (col. 6, lines 42-46). MPEP 2144.05 B.

In regards to the amended feature of an "anodic current waveform comprising at least one anodic current pulse" in claim 9 lines 8, 9 and 14, Dubin et al. '821 teaches the step of an anodic current waveform comprising at least one anodic current at least one anodic current pulse (Figure 7, elements 710 and 718).

In regards to the amended feature "wherein the second cathodic current waveform has a longer duration than the first cathodic current waveform" in claim 15, Dubin et al. '821 does teach a second cathodic current waveform having a longer duration thant the first cathodic current waveform (Figure 7, elements 714 and 722).

In regards to the balance of the amended features in claims 1, 9 and 15, they are merely grammatical corrections that are accepted, however they do not change the scope of the claims.

In regards to the amended feature in claims 4, 7, and 10-13, these are mere grammatical corrections that are accepted, however they do not change the scope of the claims.

Dubin et al. '821 as evidenced by Uzoh et al. is applied to claims 21-22 and 36-37 for the same reasons as applied to original claim 1 in pages 4-5 in the previous office action.

Regarding claim 23, Dubin et al. '821 teach that the advantage of their method is that the height of humps over small features is reduced (column 6, lines 47-49).

In regards to claims 25 and 29, Dubin et al. '821 does teach a second cathodic current waveform having a longer duration than the first cathodic current waveform (Figure 7, elements 714 and 722).

In regards to claim 26, Dubin et al. '821 teach that the cathodic current comprises a DC voltage (see Figure 7, element 706).

Dubin et al. '821 as evidenced by Uzoh et al. is applied to claim 32 for the same reasons as applied to original claim 16 in page 5 in the previous office action.

Claims 6, 11-13, 24, 27, 28, 30-31 and 33-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dubin et al. '821 evidenced by Uzoh et al. as applied to claims 1, 9 and 15 above, and further in view of Dubin et al. (US Patent No. 5,972,192).

Dubin et al. '821 in view of Uzoh et al. and further in view of Dubin et al. '192 is applied to claims 6 and 11-13 for the same reasons as stated in pages 6-7 in the previous office action.

Regarding claims 24, 28 and 35, Dubin et al. '821 evidenced by Uzoh et al. does not specifically teach the step wherein a second anodic current waveform includes a greater number of anodic current pulses than the first anodic current waveform.

Dubin et al. '192 teach a method for plating wafers comprising forward-reverse pulsing (example 2). There are a plurality of reverse (anodic) pulses. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Dubin et al. '821 in view of Uzoh el al. by applying a plurality of anodic pulses as taught by Dubin et al. '192, because Dubin et al. '192 teach that forward-reverse pulse plating results in voidless filling of trenches with large-grain deposits (column 8, lines 45-50. Furthermore, the number of pulses can per anodic step can be varied by varying the length of time of the anodic step as taught by Dubin et al. '821 (col. 6, lines 42-46). It would have been obvious to one of ordinary skill in the art at the time of invention to choose a second anodic current waveform having a longer duration (and thus more anodic current pulses) than a first anodic current waveform as Dubin et al. '821 states that the duration of each forward and reverse plating step (and thus number of anodic pulses) can be optimized so that the process as a whole provides a reduction or elimination of voids when filling small openings in an interlayer dielectric film (col. 6, lines 42-46). MPEP 2144.05 B.

Dubin et al. '821 as evidenced by Uzoh et al. and further in view of Dubin et al. '192 is applied to claim 27 for the same reasons as applied to original claim 11 in pages 6-7 in the previous office action.

Dubin et al. '821 as evidenced by Uzoh et al. and further in view of Dubin et al. '192 is applied to claims 30-31 and 33-34 for the same reasons as applied to original claims 12 and 13 in pages 6-7 in the previous office action.

Response to Arguments

Applicant's arguments filed 3/14/2006 have been fully considered but they are not persuasive.

Applicant argues:

1. Dubin '821 does not teach or disclose a second anodic current waveform having a longer duration than the first anodic current waveform.

Examiner responds:

1. See reasons above for claims 1, 9 and 15.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicholas A. Smith whose telephone number is (571)-272-8760. The examiner can normally be reached on 8:30 AM to 5:00 PM, Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571)-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

ROY KING
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700